



December 17, 2013

J. Michael Harrison, P.E.
Alabama Surface Mining Commission
P. O. Box 2390
Jasper, AL 35502-2390

RE: Kodiak Mining Company, LLC
Coke Mine No. 1, P-3887, R-5

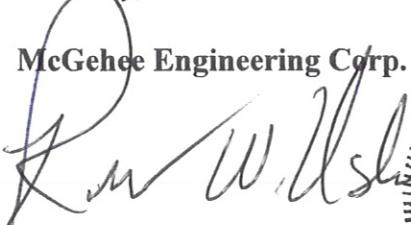
Dear Mr. Harrison:

I hereby certify the enclosed modification plans for Sediment Basin 015 for the above referenced Mine are in accordance with the Regulations of the Alabama Surface Mining Commission as adopted by Act 81-435 of December 18, 1981 and as amended to date and that the information used in the enclosed basin design plans is true and correct to the best of my knowledge and belief.

If you have any questions or need additional information, please do not hesitate to contact our office.

Sincerely,

McGehee Engineering Corp.



A circular seal for a professional engineer. The outer ring contains the words "ALABAMA" at the top and "LICENSED" at the bottom. The inner circle contains "PROFESSIONAL" at the top and "No. 15917" in the center. At the bottom of the inner circle, it says "ENGINEER". The name "ROBERT W. USHER" is written across the bottom of the inner circle. To the left of the seal is a handwritten signature of "Robert W. Usher".

Robert W. Usher, P.E.
Alabama Reg. No. 15917

**KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887**

INTRODUCTION

Revision No. 5 proposes to add additional area to the permit. Some of this area is in the watershed drains to Sediment Basin 015. This plan modifies the current plan to address the addition.

Sediment Basin 015 was originally designed and constructed as part of P-3663. Then P-3887 was proposed and it was made a part of that permit.

The proposed modifications are as follows:

1. Narrow the existing spillway to 10 feet wide.
2. Add a fixed siphon tube.
3. Raise the top of dam elevation to 402.2 (only in small areas).

The attached plans reflect current as-built surveys. Comparison of elevations such as spillway crest, differ approximately 1 to 2 feet from the original plan. This is probably the difference in survey datums from then to now.

In the preparation of the watershed map it was determined that three culverts were present through the rail road and spur. Runoff from upland areas will pass through these culverts. Information from field surveys and current topographic mapping was used to input current data for each culvert and route storm runoff through these structures prior to entering the basin.

SEDIMENT BASIN CONSTRUCTION SPECIFICATIONS

Sediment basins (temporary or permanent) will be designed and constructed using the following as minimum specifications:

1. EMBANKMENT REQUIREMENTS

- A) The minimum width of the top of the embankment will under no circumstance be less than twelve (12) feet.
- B) The embankment will have a minimum front and back slope no steeper than the slopes listed on the detailed design sheet.
- C) The foundation area of the embankment will be cleared and grubbed of all organic matter with no surface slope steeper than 1 horizontal to 1 vertical. The entire wet area, as measured from the upstream toe of the embankment to the normal pool level, will be cleared of trees and large brush.
- D) A core will be constructed in a cutoff trench along the centerline of the embankment. The cutoff trench will be of suitable depth and width to attain relatively impervious material.
- E) The embankment construction material will be free of sod, roots, stumps, rocks, etc., which exceed six (6") inches in diameter. The embankment material will be placed in layers of twelve (12") inches or less and compacted to ninety five (95%) percent of the standard proctor density, as set forth in ASTM.
- F) The embankment, foundation and abutments will be designed and constructed to be stable under normal construction and operating conditions, with a minimum static safety factor of 1.3 at normal pool level with steady seepage saturation conditions.
- G) The actual constructed height of the embankment will be a minimum of five (5%) percent higher than the design height to allow for settling over the life of the embankment.
- H) The design embankment height for temporary impoundments will be a minimum of one (1) foot above the maximum water level anticipated from a 10 Year - 24 Hour or a 25 Year - 6 Hour precipitation event (whichever is greater). The design embankment height for permanent impoundments will be a minimum of one (1) foot above the maximum water level anticipated from a 10 Year - 24 Hour or a 25 Year - 6 Hour precipitation event (whichever is greater).
- I) For embankments constructed as point source discharges, the embankment will be constructed and abutments keyed into undisturbed, virgin, ground if at all possible. In the

**KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887**

event that this can not be achieved, additional design and construction specifications will be submitted in the detailed design plans.

- J) The embankment and all areas disturbed in the construction of the embankment will be seeded with a mixture of perennial and annual grasses, fertilized and mulched to prevent erosion and ensure restabilization. Hay dams, silt fences, rock check dams, etc. will be installed, where deemed necessary, as additional erosion prevention methods.

2. DISCHARGE STRUCTURE REQUIREMENTS

- A) The primary spillway will be designed to adequately carry the anticipated peak runoff from a 10 Year - 24 Hour precipitation event. The combination primary and secondary (emergency) spillway system will be designed to safely carry the anticipated peak runoff from a 25 Year - 6 Hour precipitation event. When sediment basins are proposed in the drainage course of a public water supply, the spillway system will be designed and constructed to adequately carry the runoff from a 50 Year - 24 Hour precipitation event.
- B) Channel linings, for secondary (emergency) spillways will be a trapezoidal open channel constructed in natural ground and planted with a mixture of both annual and perennial grasses being predominantly fescue and bermuda. In the event that the spillway can not be constructed in natural ground the spillway will be lined with riprap, concrete, asphalt or durable rock (See Detailed Design Plans for Spillway Lining).
- C) When consisting of pipe, the primary spillway will be installed according to Class "C" pipe installation for embankment bedding.
- D) Sediment basins with a single spillway system, such as a skimmer board, will be a trapezoidal open channel constructed in consolidated, nonerodible material and lined with rip-rap, concrete, asphalt or durable rock (See Detailed Design Plans for Spillway Lining).
- E) The primary spillway will be designed and constructed with device to eliminate floating solids from leaving the impoundment. This device will consist of a turned down elbow when using pipe or a skimmer system when using an open channel spillway.
- F) When necessary, to prevent erosion of the embankment or discharge area, a splash pad of rip-rap, durable rock, sacrete, etc. will be installed at the discharge end of the primary spillway.
- G) The combined spillway systems, for sediment basins constructed in series, will be designed to adequately accommodate the entire drainage area.

3. INSPECTION, MAINTENANCE AND CERTIFICATION REQUIREMENTS

**KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887**

- A) Inspections will be conducted regularly during construction of the sediment basin by a qualified registered professional engineer or other qualified person under the direction of a professional engineer. Upon completion of construction, the sediment basin will be certified, by a qualified registered professional engineer, to the Regulatory Authority as having been constructed in accordance with the approved detailed design plans.
- B) Sediment basins will be inspected semi-monthly for erosion, instability, etc., with maintenance performed as necessary, until the removal of the structure or until a Phase III Bond Release is granted.
- C) Sediment basins will be examined quarterly for structural weakness, instability, erosion, slope failure, or other hazardous conditions with maintenance performed as necessary.
- D) Formal inspections will be made annually, by a qualified registered professional engineer or other qualified person under the direction of a professional engineer, including any reports or modifications, in accordance with 880-X- 10C- .20[1(j)] of the Alabama Surface Mining Regulations.
- E) Retained sediment will be removed from each sediment basin when the accumulated sediment reaches the maximum allowable sediment volume as set forth in the detailed design plans.

4. BASIN REMOVAL REQUIREMENTS

- A) Upon completion of mining, reclamation, restabilization and effluent standards being met, each sediment basin not proposed as a permanent water impoundment will be dewatered in a controlled manner by either pumping or siphoning. Upon successful dewatering, a determination will be made as to the retained sediment level in the basin. After determining the retained sediment level, a channel will be cut into the embankment down to the retained sediment level on the side of the embankment deemed most suitable to reach natural ground without encountering prohibiting rock. The embankment material removed from this newly constructed channel will be spread and compacted over the previous impoundment (wet area) area to prevent erosion and ensure restabilization. The newly constructed channel will be of adequate width (minimum 30 feet) and sloped to a grade (approximately 1% to 3%) which will cause all surface drainage to travel across this area in sheet flow, minimizing the possibility of erosion. Also, where necessary, hay dams will be installed in strategic locations across the width of the channel to retain sediment and slow the water velocity to a favorable rate. Upon removal of the embankment section, all disturbed areas will be graded in such a manner to ensure slope stability, successful restabilization and to minimize erosion. All disturbed areas will be seeded with a mixture of annual and perennial grasses, fertilized and mulched. No slope, existing or created in the removal of the sediment basin, will be left on a grade that will slip or slough.

5. PERMANENT WATER IMPOUNDMENT REQUIREMENTS

**KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887**

- A) Prior to a request for a Phase II Bond Release, all sediment basins being left as permanent water impoundments will have supplemental data submitted to the Regulatory Authority concerning water quality, water quantity, size, depth, configuration, postmining land use, etc.
- B) Final grading slopes of the entire permanent water impoundment area will not exceed a slope of 2 Horizontal to 1 Vertical to provide for safety and access for future water users.

BASIN 015

Elevation-Area-Capacity Table

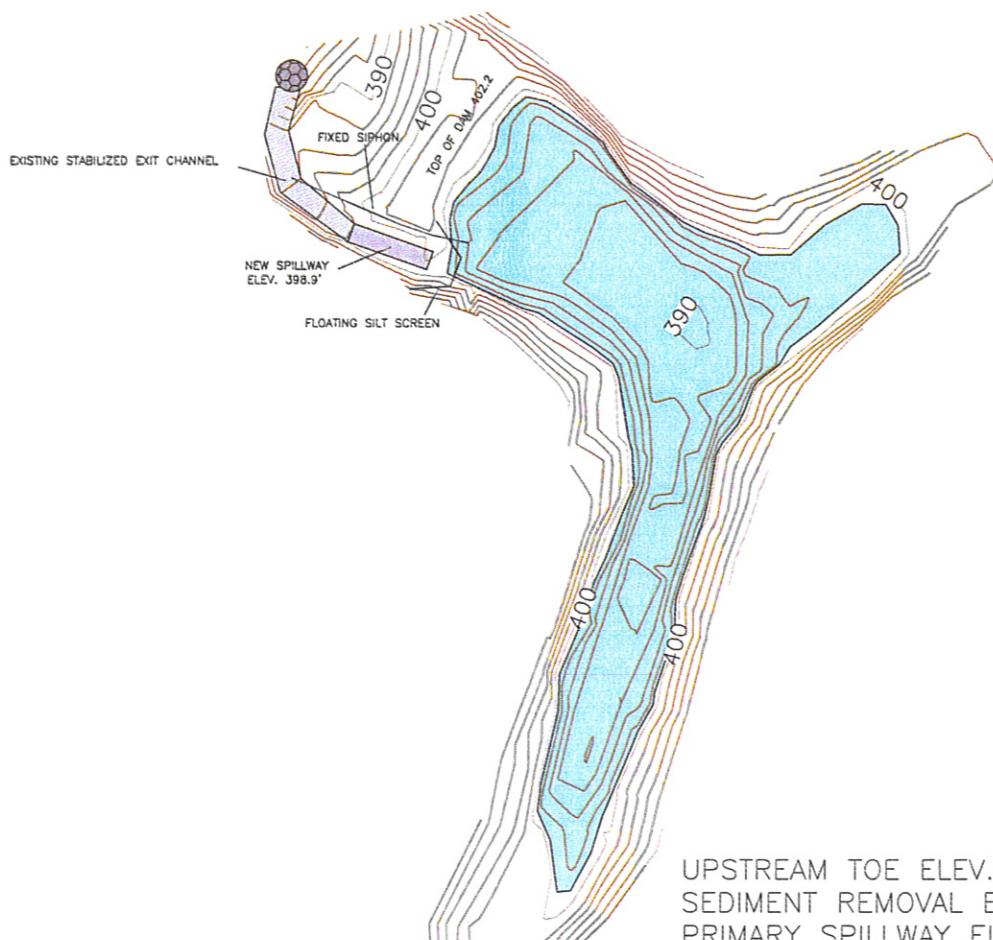
Elevation (ft)	Area (ac)	Capacity (ac-ft)
379.90	0.000	0.000
380.90	0.002	0.001
381.00	0.002	0.001
381.90	0.007	0.005
382.00	0.008	0.005
382.90	0.017	0.016
383.90	0.031	0.040
384.00	0.032	0.043
384.90	0.048	0.079
385.00	0.050	0.084
385.90	0.090	0.146
386.00	0.095	0.155
386.90	0.107	0.246
387.90	0.122	0.360
388.00	0.123	0.373
388.90	0.152	0.496
389.00	0.155	0.511
389.90	0.186	0.665
390.00	0.190	0.684
390.90	0.225	0.870
391.00	0.229	0.893
391.90	0.267	1.116
392.00	0.271	1.143
392.90	0.312	1.405
393.00	0.317	1.436
393.90	0.362	1.742
394.00	0.367	1.778
394.90	0.419	2.132
395.00	0.425	2.174
395.90	0.471	2.577
396.00	0.476	2.624
396.90	0.524	3.074
397.00	0.529	3.126
397.90	0.579	3.625
398.00	0.585	3.683
398.90	0.638	4.233
399.00	0.644	4.297

SEDCAD 4.0

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2

Elevation (ft)	Area (ac)	Capacity (ac-ft)
399.90	0.694	4.900
400.00	0.700	4.969
400.90	0.749	5.621
401.90	0.805	6.398
402.00	0.811	6.479
402.90	0.864	7.233
403.00	0.870	7.319



UPSTREAM TOE ELEV.: 379.9'
 SEDIMENT REMOVAL ELEV.: 396.09'
 PRIMARY SPILLWAY ELEV.: 398.9'
 FIXED SIPHON: 4" PLASTIC PIPE
 SIPHON INLET ELEV. 396.7'
 SIPHON CREST ELEV. 398'
 **MAXIMUM WATER ELEV.: 401.11'
 TOP OF DAM ELEV.: 402.2'

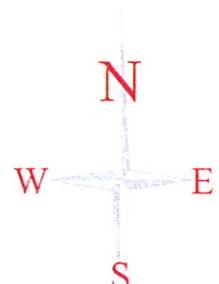


ENERGY DISSIPATER (CLASS II
SANDSTONE RIPRAP)

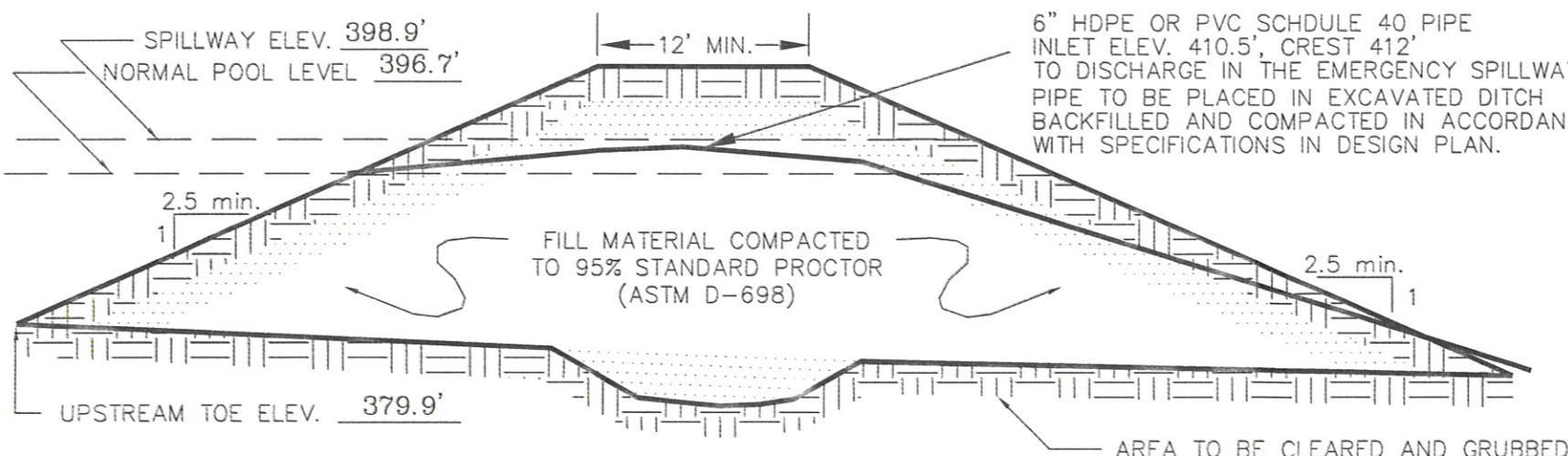
SPILLWAY: 10' WIDE TRAPEZOIDAL,
CONCRETE LINED

KODIAK MINING COMPANY, LLC
COKE MINE #1, P-3887, R-5
SEDIMENT BASIN 015 MODIFICATION

PLAN VIEW DRAWING
SCALE: 1" = 100'



EMBANKMENT CROSS-SECTION



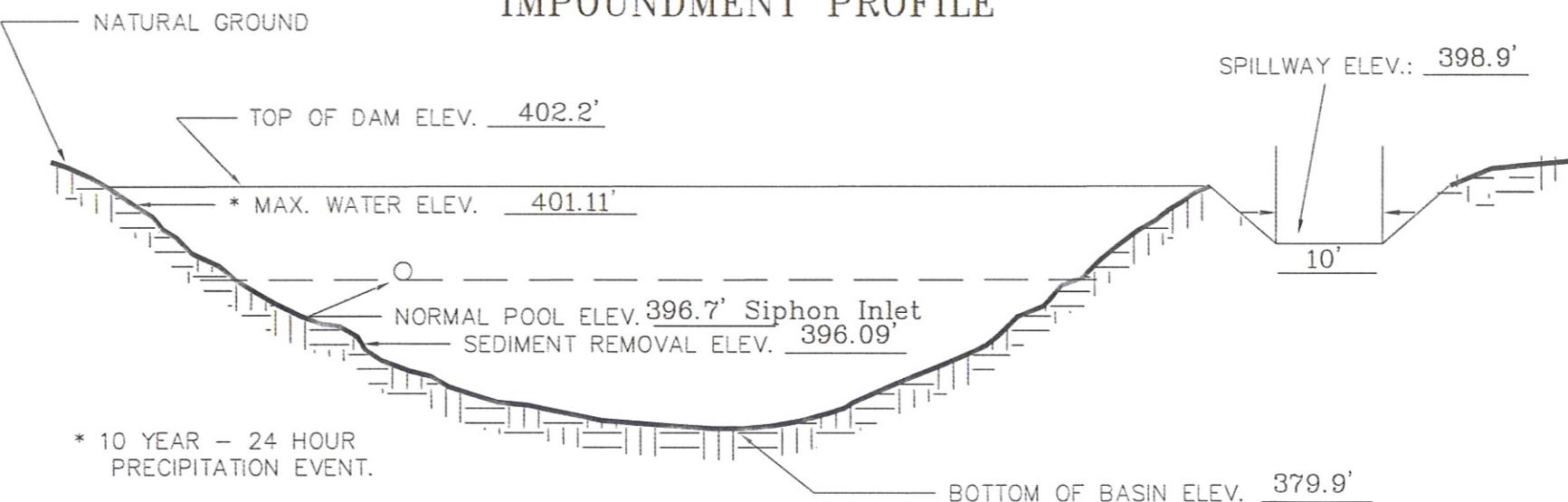
COMPANY: KODIAK MINING COMPANY, LLC

MINE NAME: COKE MINE #1

PERMIT #: P-3887, R-5

BASIN I.D. #: SEDIMENT BASIN 015 MODIFICATION

IMPOUNDMENT PROFILE



KEY BASIN PARAMETERS

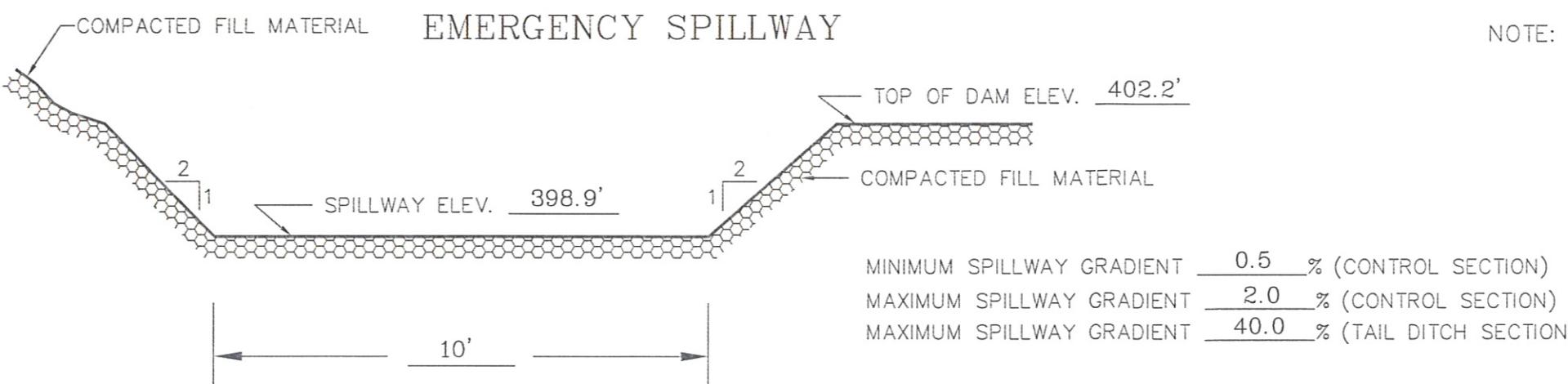
DRAINAGE AREA	<u>157.7</u>	ACRES
DISTURBED AREA	<u>19.91</u>	ACRES
SEDIMENT STORAGE	<u>2.7</u>	AC.FT.
DETENTION STORAGE	<u>1.56</u>	AC.FT.
PERMANENT POOL CAPACITY	<u>4.26</u>	AC.FT.
* TOTAL BASIN STORAGE CAPACITY . . .	<u>5.55</u>	AC.FT.
* PEAK INFLOW	<u>134.48</u>	C.F.S.
* PEAK OUTFLOW	<u>124.85</u>	C.F.S.

NOTE: ALL ELEVATIONS ASSUMED.

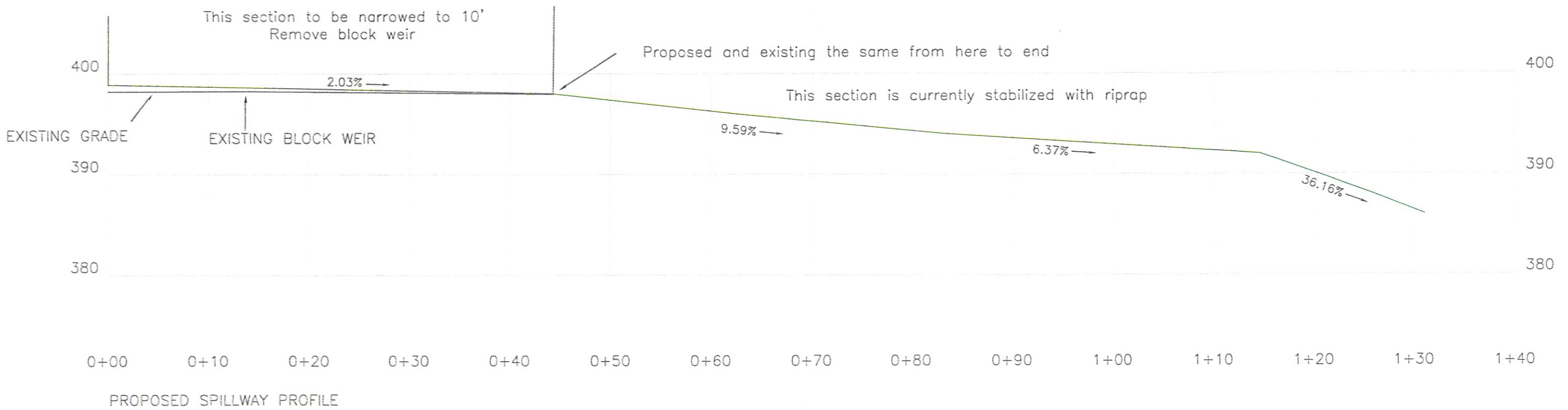
* 10 YEAR - 24 HOUR PRECIPITATION EVENT.

** 25 YEAR - 6 HOUR PRECIPITATION EVENT.

EMERGENCY SPILLWAY



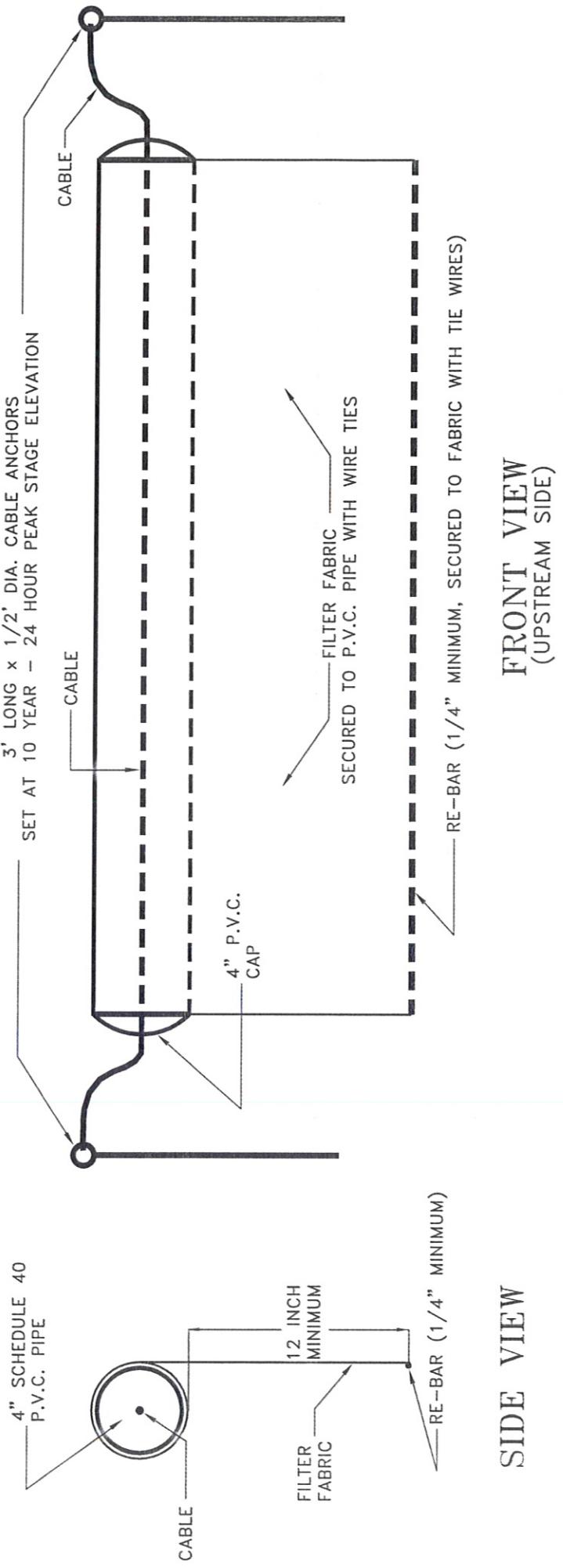
SEE SPILLWAY CONTROL SECTION AND TAIL DITCH DESIGN FOR CHANNEL LINING REQUIREMENTS.



**KODIAK MINING COMPANY, LLC
COKE MINE #1, P-3887, R-5
SEDIMENT BASIN 015 MODIFICATION**

**SPILLWAY PROFILE
SCALE: 1" = 10' H&V**

FLOATING SILT FENCE SUBSURFACE WITHDRAWAL DEVICE



NOTE: THE FILTER FABRIC TO BE USED WILL HAVE AN E.O.S.
BETWEEN 20 AND 100.

THE DEPTH FROM THE GROUND LINE TO THE BOTTOM
OF THE FILTER FABRIC WILL BE A MINIMUM OF 2 FEET.



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**KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887**

**SPILLWAY CHANNEL SPECIFICATIONS
SEDIMENT BASIN 015**

The existing spillway has a block weir inside a concrete lined trapezoidal channel. The tail ditch section from the block weir is concrete for a short distance and then is lined with large riprap. The tail ditch varies in width from 12 to 14 feet. The entire spillway is stable and shows not major erosion. A profile of the existing and proposed changes is attached.

This plan proposes to change the spillway in the control section to make a 10 feet wide trapezoidal channel lined with four inches of concrete. It will tie to the existing tail ditch which is in tack. Calculations in this section are based on a continuous 10 feet control and tail ditch section to eliminate various depths along the profile. During the modifications riprap and concrete will be extended as necessary to accommodate these calculations.

The entire control section of the emergency spillway will be lined with a minimum of 4 inches of reinforced concrete. All concrete will be reinforced with 10 gauge, 6" x 6" welded wire mesh. Fibermesh may be added to the concrete for additional strength, however, the addition of fibermesh shall not be used in place of the required 6" x 6" welded wire.

The gradient of the control section of the emergency spillway will not exceed 2 percent. The gradient of the tail ditch section of the emergency spillway will not exceed thirty six (36%) percent.

The concrete liner of the control section of the emergency spillway will be a minimum of 3.2 feet as measured vertically, allowing 2.2 feet for the maximum anticipated flow and 1.0 feet of dry freeboard. The riprap liner of the tail ditch section of the emergency spillway will be a minimum as shown on the attached SEDCAD4 flow calculations attached. All calculations show Class 2 riprap is sufficient. In most areas the existing conditions will meet this design. Riprap will be added in any areas not meeting the design. The original design shows the 36% slope area to have Class 5 stone. There is very large stone in this section. As stated above, there is no signs of erosion in the existing spillway, therefore only minor maintenance as necessary will be performed.

See enclosed SEDCAD 4.0 spillway tail ditch section design and attached Plan Sheet cross-section for the minimum and maximum emergency spillway construction requirements.

A floating silt fence will be installed near the entrance to the spillway to accomplish sub-surface withdrawal. See enclosed Floating Silt Fence Design Drawing.

Control Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	2.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	124.90 cfs	
Depth:	1.13 ft	2.13 ft
Top Width:	14.51 ft	18.51 ft
Velocity:	9.05 fps	
X-Section Area:	13.81 sq ft	
Hydraulic Radius:	0.918 ft	
Froude Number:	1.63	

Tail Ditch @9.5%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	9.5	1.00		

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	124.90 cfs	
Depth:	0.84 ft	1.84 ft
Top Width:	13.35 ft	17.35 ft
Velocity*:		
X-Section Area:	9.76 sq ft	
Hydraulic Radius:	0.711 ft	
Froude Number*:		
Manning's n*:		
Dmin:	4.00 in	
D50:	12.00 in	
Dmax:	15.00 in	

Velocity and Manning's n calculations may not apply for this method.

Tail Ditch @6.4%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	6.4	1.00		

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	124.90 cfs	
Depth:	0.87 ft	1.87 ft
Top Width:	13.48 ft	17.48 ft
Velocity*:		
X-Section Area:	10.20 sq ft	
Hydraulic Radius:	0.735 ft	
Froude Number*:		
Manning's n*:		
Dmin:	4.00 in	
D50:	12.00 in	
Dmax:	15.00 in	

Velocity and Manning's n calculations may not apply for this method.

Tail Ditch @36.4%

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	36.2	1.00		

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	124.90 cfs	
Depth:	0.34 ft	1.34 ft
Top Width:	11.36 ft	15.36 ft
Velocity*:		
X-Section Area:	3.64 sq ft	
Hydraulic Radius:	0.316 ft	
Froude Number*:		
Manning's n*:		
Dmin:	9.00 in	
D50:	27.00 in	
Dmax:	33.75 in	

Velocity and Manning's n calculations may not apply for this method.

KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887

**HYDROLOGY AND SEDIMENTOLOGY PREDICTION
10 YEAR - 24 HOUR PRECIPITATION EVENT
SEDIMENT BASIN 015**

KODIAK MINING COMPANY, LLC
COKE MINE NO. 1, P-3887, R-5
SEDIMENT BASIN 015 MODIFICATION

10YR, 24HR

Robert W. Usher, P.E.

General Information

Storm Information:

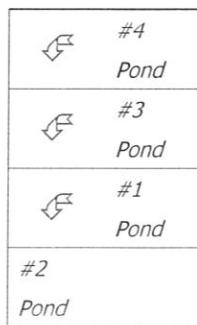
Storm Type:	DRN 58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	6.000 inches

Particle Size Distribution:

Size (mm)	TOPSOIL	SPOIL
3.0000	96.000%	64.000%
2.0000	94.000%	63.000%
1.0000	86.000%	61.000%
0.5000	63.000%	52.000%
0.3000	48.000%	40.000%
0.2000	36.000%	29.000%
0.1000	20.000%	19.000%
0.0500	13.000%	15.000%
0.0300	9.000%	12.000%
0.0200	8.000%	10.000%
0.0100	6.000%	7.000%
0.0050	4.000%	2.000%
0.0030	3.000%	1.000%
0.0010	0.500%	0.100%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	#2	0.093	0.318	CLVERT 2
Pond	#2	==>	End	0.000	0.000	BASIN 015
Pond	#3	==>	#2	0.036	0.380	CULVERT 2A 4
Pond	#4	==>	#2	0.008	0.395	CULVERT 3



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	7. Paved area and small upland gullies	2.20	22.00	1,000.00	2.98	0.093
#1	Muskingum K:					0.093
#3	7. Paved area and small upland gullies	7.14	50.00	700.00	5.37	0.036
#3	Muskingum K:					0.036
#4	7. Paved area and small upland gullies	10.00	20.00	200.00	6.36	0.008
#4	Muskingum K:					0.008

SEDCAD 4 for Windows

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Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#4	In	17.150	17.150	8.64	2.27	2.9	1,656	1.21	0.69
	Out			8.46	2.27	0.3	168	0.03	0.02
#3	In	43.160	43.160	24.73	6.39	6.8	1,358	0.99	0.57
	Out			24.45	6.39	0.7	148	0.03	0.02
#1	In	66.260	66.260	40.92	10.80	19.9	2,362	1.72	0.99
	Out			40.83	10.80	2.6	342	0.11	0.07
#2	In	31.100	157.670	95.38	25.85	1,336.5	151,253	112.89	27.66
	Out			91.13	26.71	88.9	6,564	0.50	0.20

Particle Size Distribution(s) at Each Structure***Structure #4 (CULVERT 3):***

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	100.000%	100.000%
0.5000	85.500%	100.000%
0.3000	65.143%	100.000%
0.2000	48.857%	100.000%
0.1000	27.143%	100.000%
0.0500	17.643%	100.000%
0.0300	12.214%	100.000%
0.0200	10.857%	100.000%
0.0100	8.143%	80.454%
0.0050	5.429%	53.636%
0.0030	4.071%	40.227%
0.0010	0.679%	6.705%

Structure #3 (CULVERT 2A 4):

Size (mm)	In	Out
3.0000	97.681%	100.000%
2.0000	97.581%	100.000%
1.0000	97.381%	100.000%
0.5000	83.245%	100.000%
0.3000	63.463%	100.000%
0.2000	47.497%	100.000%
0.1000	26.676%	100.000%
0.0500	17.604%	100.000%
0.0300	12.349%	100.000%
0.0200	10.910%	100.000%
0.0100	8.133%	76.603%
0.0050	5.155%	48.560%
0.0030	3.817%	35.949%
0.0010	0.629%	5.929%

Structure #1 (CLVERT 2):

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	100.000%	100.000%
0.5000	84.277%	100.000%
0.3000	64.211%	100.000%
0.2000	48.158%	100.000%
0.1000	26.755%	100.000%
0.0500	17.390%	100.000%
0.0300	12.040%	90.503%
0.0200	10.702%	80.447%
0.0100	8.026%	60.335%
0.0050	5.351%	40.224%
0.0030	4.013%	30.168%
0.0010	0.669%	5.028%

Structure #2:

Size (mm)	In	Out
3.0000	96.018%	100.000%
2.0000	94.028%	100.000%
1.0000	86.064%	100.000%
0.5000	63.143%	100.000%
0.3000	48.175%	100.000%
0.2000	36.200%	100.000%
0.1000	20.233%	100.000%
0.0500	13.247%	100.000%
0.0300	9.237%	100.000%
0.0200	8.219%	100.000%
0.0100	6.167%	92.695%
0.0050	4.110%	61.776%
0.0030	3.082%	46.329%
0.0010	0.514%	7.721%

Structure Detail:

Structure #4 (Pond)

CULVERT 3

Pond Inputs:

Initial Pool Elev:	428.57 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**No sediment capacity defined*

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
24.00	92.00	16.00	0.0240	428.57	0.90	0.00

Pond Results:

Peak Elevation:	430.16 ft
H'graph Detention Time:	0.04 hrs
Pond Model:	CSTRS
Dewater Time:	0.56 days
Trap Efficiency:	89.88 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
428.00	0.000	0.000	0.000	Top of Sed. Storage
428.50	0.003	0.001	0.000	
428.57	0.004	0.001	0.000	Spillway #1
429.00	0.013	0.004	1.185	6.60
429.50	0.028	0.015	3.758	6.10
430.00	0.050	0.034	7.167	0.55
430.16	0.048	0.042	8.460	0.15 Peak Stage
430.50	0.058	0.061	11.231	
431.00	0.066	0.092	15.573	
431.50	0.074	0.126	19.061	

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8

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
432.00	0.083	0.166	22.032	
432.50	0.093	0.210	24.663	
433.00	0.103	0.259	27.016	
433.50	0.114	0.313	29.187	
434.00	0.125	0.372	31.209	
434.50	0.137	0.438	33.110	
435.00	0.149	0.509	34.909	
435.50	0.162	0.586	36.624	
436.00	0.175	0.671	38.248	
436.50	0.189	0.761	39.808	
437.00	0.203	0.859	41.315	
437.50	0.218	0.964	42.775	
438.00	0.233	1.077	44.176	
438.50	0.249	1.198	45.534	
439.00	0.266	1.326	46.862	
439.50	0.283	1.463	48.145	
440.00	0.300	1.609	49.395	
440.50	0.325	1.765	50.625	
441.00	0.352	1.935	51.809	
441.50	0.379	2.117	52.836	
442.00	0.408	2.314	53.548	
442.50	0.437	2.525	54.260	
443.00	0.468	2.751	54.857	
443.50	0.499	2.993	55.350	
444.00	0.532	3.251	55.843	
444.50	0.565	3.525	56.336	
445.00	0.600	3.816	56.821	

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
428.00	0.000	0.000
428.50	0.000	0.000
428.57	0.000	0.000
429.00	(3)>1.185	1.185
429.50	(3)>3.758	3.758
430.00	(3)>7.167	7.167
430.50	(3)>11.231	11.231

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Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
431.00	(4)>15.573	15.573
431.50	(5)>19.061	19.061
432.00	(5)>22.032	22.032
432.50	(5)>24.663	24.663
433.00	(5)>27.016	27.016
433.50	(5)>29.187	29.187
434.00	(5)>31.209	31.209
434.50	(5)>33.110	33.110
435.00	(5)>34.909	34.909
435.50	(5)>36.624	36.624
436.00	(5)>38.248	38.248
436.50	(5)>39.808	39.808
437.00	(5)>41.315	41.315
437.50	(5)>42.775	42.775
438.00	(5)>44.176	44.176
438.50	(5)>45.534	45.534
439.00	(5)>46.862	46.862
439.50	(5)>48.145	48.145
440.00	(5)>49.395	49.395
440.50	(5)>50.625	50.625
441.00	(5)>51.809	51.809
441.50	(5)>52.836	52.836
442.00	(5)>53.548	53.548
442.50	(6)>54.260	54.260
443.00	(6)>54.857	54.857
443.50	(6)>55.350	55.350
444.00	(6)>55.843	55.843
444.50	(6)>56.336	56.336
445.00	(6)>56.821	56.821

Structure #3 (Pond)

CULVERT 2A 4

Pond Inputs:

Initial Pool Elev:	443.50 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**No sediment capacity defined*

Straight Pipe

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10

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
42.00	53.00	12.00	0.0240	443.50	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
30.00	48.00	6.00	0.0240	446.56	0.90	0.00

Pond Results:

Peak Elevation:	445.73 ft
H'graph Detention Time:	0.02 hrs
Pond Model:	CSTRS
Dewater Time:	0.56 days
Trap Efficiency:	89.38 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
443.00	0.000	0.000	0.000	Top of Sed. Storage
443.50	0.003	0.000	0.000	Spillway #1
444.00	0.011	0.004	2.591	2.00
444.50	0.023	0.012	7.333	9.95
445.00	0.041	0.028	13.465	1.20
445.50	0.064	0.054	20.730	0.25
445.73	0.078	0.072	24.448	0.10 Peak Stage
446.00	0.092	0.093	28.971	
446.50	0.126	0.147	38.083	
446.56	0.130	0.155	39.231	Spillway #2
447.00	0.164	0.219	49.520	
447.50	0.207	0.312	63.402	
448.00	0.256	0.427	76.402	
448.50	0.309	0.569	89.511	
449.00	0.368	0.738	102.558	
449.50	0.431	0.937	115.682	
450.00	0.500	1.170	126.744	

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11

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
450.50	0.505	1.421	137.008	
451.00	0.510	1.675	146.467	

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
443.00	0.000	0.000	0.000
443.50	0.000	0.000	0.000
444.00	(3)>2.591	0.000	2.591
444.50	(3)>7.333	0.000	7.333
445.00	(3)>13.465	0.000	13.465
445.50	(3)>20.730	0.000	20.730
446.00	(3)>28.971	0.000	28.971
446.50	(3)>38.083	0.000	38.083
446.56	(3)>39.231	0.000	39.231
447.00	(3)>47.988	(3)>1.531	49.520
447.50	(3)>58.627	(3)>4.775	63.402
448.00	(5)>67.352	(3)>9.050	76.402
448.50	(5)>75.364	(3)>14.147	89.511
449.00	(5)>82.600	(3)>19.958	102.558
449.50	(5)>89.292	(3)>26.390	115.682
450.00	(5)>95.481	(5)>31.263	126.744
450.50	(5)>101.293	(5)>35.714	137.008
451.00	(5)>106.797	(5)>39.671	146.467

Structure #1 (Pond)

CLVERT 2

Pond Inputs:

Initial Pool Elev:	421.00 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Straight Pipe

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12

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
42.00	122.00	2.70	0.0240	421.00	0.90	0.00

Pond Results:

Peak Elevation:	424.14 ft
H'graph Detention Time:	0.00 hrs
Pond Model:	CSTRS
Dewater Time:	0.57 days
Trap Efficiency:	86.70 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
419.50	0.000	0.000	0.000	Top of Sed. Storage
420.00	0.000	0.000	0.000	
420.50	0.000	0.000	0.000	
421.00	0.001	0.001	0.000	Spillway #1
421.50	0.002	0.001	2.591	1.95
422.00	0.002	0.002	7.333	5.10
422.50	0.003	0.004	13.465	5.35
423.00	0.005	0.006	20.730	0.70
423.50	0.006	0.008	28.971	0.30
424.00	0.007	0.012	38.083	0.10
424.14	0.008	0.013	40.829	0.10 Peak Stage
424.50	0.009	0.016	47.988	
425.00	0.011	0.020	58.627	
425.50	0.013	0.026	67.352	
426.00	0.015	0.033	75.364	
426.50	0.017	0.041	82.600	
427.00	0.019	0.050	89.292	
427.50	0.022	0.061	95.351	
428.00	0.025	0.072	100.123	
428.50	0.028	0.085	103.478	
429.00	0.031	0.100	106.728	
429.50	0.034	0.116	109.912	
430.00	0.037	0.134	112.967	
430.50	0.041	0.153	115.962	
431.00	0.045	0.175	118.886	

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13

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
431.50	0.048	0.198	121.721	
432.00	0.052	0.223	124.526	
432.50	0.057	0.250	127.223	
433.00	0.061	0.280	129.906	
433.50	0.066	0.311	132.499	
434.00	0.070	0.345	135.074	
434.50	0.075	0.382	137.572	
435.00	0.080	0.420	140.053	
435.50	0.109	0.468	142.464	
436.00	0.143	0.531	144.865	
436.50	0.182	0.612	147.193	
437.00	0.225	0.713	149.521	
437.50	0.273	0.837	151.776	
438.00	0.325	0.987	154.028	
438.50	0.382	1.163	156.226	
439.00	0.443	1.369	158.406	
439.50	0.509	1.607	160.556	
440.00	0.580	1.880	162.669	
440.50	0.682	2.195	164.776	
441.00	0.792	2.563	166.826	
441.50	0.911	2.988	168.876	
442.00	1.037	3.475	170.887	
442.50	1.172	4.027	172.877	
443.00	1.315	4.648	174.859	
443.50	1.467	5.343	176.793	
444.00	1.626	6.116	178.727	
444.50	1.794	6.971	180.632	
445.00	1.970	7.911	182.513	

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
419.50	0.000	0.000
420.00	0.000	0.000
420.50	0.000	0.000
421.00	0.000	0.000
421.50	(3)>2.591	2.591
422.00	(3)>7.333	7.333

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Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
422.50	(3)>13.465	13.465
423.00	(3)>20.730	20.730
423.50	(3)>28.971	28.971
424.00	(3)>38.083	38.083
424.50	(3)>47.988	47.988
425.00	(3)>58.627	58.627
425.50	(5)>67.352	67.352
426.00	(5)>75.364	75.364
426.50	(5)>82.600	82.600
427.00	(5)>89.292	89.292
427.50	(5)>95.351	95.351
428.00	(6)>100.123	100.123
428.50	(6)>103.478	103.478
429.00	(6)>106.728	106.728
429.50	(6)>109.912	109.912
430.00	(6)>112.967	112.967
430.50	(6)>115.962	115.962
431.00	(6)>118.886	118.886
431.50	(6)>121.721	121.721
432.00	(6)>124.526	124.526
432.50	(6)>127.223	127.223
433.00	(6)>129.906	129.906
433.50	(6)>132.499	132.499
434.00	(6)>135.074	135.074
434.50	(6)>137.572	137.572
435.00	(6)>140.053	140.053
435.50	(6)>142.464	142.464
436.00	(6)>144.865	144.865
436.50	(6)>147.193	147.193
437.00	(6)>149.521	149.521
437.50	(6)>151.776	151.776
438.00	(6)>154.028	154.028
438.50	(6)>156.226	156.226
439.00	(6)>158.406	158.406
439.50	(6)>160.556	160.556
440.00	(6)>162.669	162.669
440.50	(6)>164.776	164.776
441.00	(6)>166.826	166.826
441.50	(6)>168.876	168.876
442.00	(6)>170.887	170.887

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15

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
442.50	(6)>172.877	172.877
443.00	(6)>174.859	174.859
443.50	(6)>176.793	176.793
444.00	(6)>178.727	178.727
444.50	(6)>180.632	180.632
445.00	(6)>182.513	182.513

Structure #2 (Pond)

BASIN 015

Pond Inputs:

Initial Pool Elev:	396.70 ft
Initial Pool:	0.30 ac-ft
*Sediment Storage:	2.70 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
398.90	10.00	2.00:1	2.00:1	10.00

Fixed Siphon

Crest Elev	Inlet Elev	Outlet Elev	Diameter (in)	Length (ft)	Manning's n
398.00	396.70	390.00	4.00	75.00	0.0130

Pond Results:

Peak Elevation:	400.75 ft
H'graph Detention Time:	2.13 hrs
Pond Model:	CSTRS
Dewater Time:	1.26 days
Trap Efficiency:	93.35 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

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16

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
396.09	0.478	0.000	0.000		Top of Sed. Storage
396.40	0.494	0.151	0.000		
396.70	0.510	0.301	0.000		
396.90	0.520	0.404	0.904	1.38*	
397.20	0.537	0.563	0.925	2.07*	
397.40	0.549	0.672	0.939	1.40*	
397.90	0.579	0.953	0.972	3.51*	
398.00	0.585	1.012	0.978	0.72*	Spillway #2
398.40	0.609	1.250	1.004	2.95	
398.90	0.640	1.562	1.035	3.70	Spillway #1
399.40	0.669	1.890	3.149	2.35	
399.90	0.699	2.232	29.636	10.45	
400.40	0.729	2.588	62.079	1.15	
400.75	0.751	2.852	91.133	0.45	Peak Stage
400.90	0.760	2.961	103.184		
401.40	0.787	3.347	154.137		
401.90	0.814	3.748	215.214		
402.40	0.842	4.162	286.754		
402.90	0.870	4.589	369.119		
403.40	0.899	5.032	462.678		
403.90	0.929	5.489	567.804		
404.40	0.959	5.961	684.865		
404.90	0.990	6.448	814.223		

*Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
396.09	0.000	0.000	0.000
396.40	0.000	0.000	0.000
396.70	0.000	0.000	0.000
396.90	0.000	0.904*	0.904
397.20	0.000	0.925*	0.925
397.40	0.000	0.939*	0.939
397.90	0.000	0.972*	0.972
398.00	0.000	0.978	0.978
398.40	0.000	1.004	1.004
398.90	0.000	1.035	1.035

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17

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
399.40	2.083	1.065	3.149
399.90	28.541	1.095	29.636
400.40	60.955	1.124	62.079
400.90	102.032	1.152	103.184
401.40	152.957	1.180	154.137
401.90	214.007	1.207	215.214
402.40	285.521	1.234	286.754
402.90	367.859	1.260	369.119
403.40	461.393	1.285	462.678
403.90	566.494	1.311	567.804
404.40	683.530	1.335	684.865
404.90	812.863	1.360	814.223

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18

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#4	1	17.150	0.125	0.000	0.000	65.000	S	8.64	2.267
	Σ	17.150						8.64	2.267
#3	1	35.560	0.125	0.000	0.000	65.000	S	17.91	4.700
	2	7.600	0.125	0.000	0.000	75.000	M	6.83	1.689
	Σ	43.160						24.73	6.389
#1	1	66.260	0.125	0.000	0.000	71.000	S	40.92	10.796
	Σ	66.260						40.92	10.796
#2	1	12.000	0.050	0.000	0.000	81.000	F	15.58	3.878
	2	19.100	0.125	0.000	0.000	65.000	S	9.62	2.524
	Σ	157.670						95.38	25.854

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#4	1	0.320	200.00	19.00	0.0030	1.0000	1	2.9	1,656	1.21	0.69
	Σ							2.9	1,656	1.21	0.69
#3	1	0.320	200.00	18.00	0.0030	1.0000	1	6.2	1,696	1.24	0.71
	2	0.250	50.00	1.00	0.0500	1.0000	2	0.6	459	0.33	0.19
	Σ							6.8	1,358	0.99	0.57
#1	1	0.320	200.00	22.00	0.0030	1.0000	1	19.9	2,362	1.72	0.99
	Σ							19.9	2,362	1.72	0.99
#2	1	0.320	200.00	19.00	0.9000	1.0000	1	1,330.3	377,021	281.93	167.88
	2	0.240	200.00	19.00	0.0030	1.0000	1	2.5	1,258	0.92	0.53
	Σ							1,336.5	151,253	112.89	27.66

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	7. Paved area and small upland gullies	2.78	50.00	1,800.00	3.350	0.149

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19

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	Time of Concentration:					0.050

**KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887**

**HYDROLOGY AND SEDIMENTOLOGY PREDICTION
25 YEAR - 6 HOUR PRECIPITATION EVENT
SEDIMENT BASIN 015**

KODIAK MINING COMPANY, LLC
COKE MINE NO. 1, P-3887, R-5
SEDIMENT BASIN 015 MODIFICATION

25YR, 6HR

Robert W. Usher, P.E.

General Information

Storm Information:

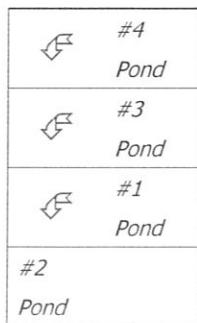
Storm Type:	SCS 6 HOUR
Design Storm:	10 yr - 24 hr
Rainfall Depth:	5.100 inches

Particle Size Distribution:

Size (mm)	TOPSOIL	SPOIL
3.0000	96.000%	64.000%
2.0000	94.000%	63.000%
1.0000	86.000%	61.000%
0.5000	63.000%	52.000%
0.3000	48.000%	40.000%
0.2000	36.000%	29.000%
0.1000	20.000%	19.000%
0.0500	13.000%	15.000%
0.0300	9.000%	12.000%
0.0200	8.000%	10.000%
0.0100	6.000%	7.000%
0.0050	4.000%	2.000%
0.0030	3.000%	1.000%
0.0010	0.500%	0.100%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	#2	0.093	0.318	CLVERT 2
Pond	#2	==>	End	0.000	0.000	BASIN 015
Pond	#3	==>	#2	0.036	0.380	CULVERT 2A 4
Pond	#4	==>	#2	0.008	0.395	CULVERT 3



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	7. Paved area and small upland gullies	2.20	22.00	1,000.00	2.98	0.093
#1	Muskingum K:					0.093
#3	7. Paved area and small upland gullies	7.14	50.00	700.00	5.37	0.036
#3	Muskingum K:					0.036
#4	7. Paved area and small upland gullies	10.00	20.00	200.00	6.36	0.008
#4	Muskingum K:					0.008

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Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#4	In	17.150	17.150	12.73	1.66	3.1	2,080	1.49	0.97
	Out			11.77	1.66	0.4	249	0.04	0.03
#3	In	43.160	43.160	38.94	4.74	7.2	1,663	1.19	0.80
	Out			36.56	4.74	0.9	206	0.04	0.03
#1	In	66.260	66.260	66.95	8.17	22.4	3,144	2.26	1.45
	Out			66.61	8.17	3.4	522	0.17	0.10
#2	In	31.100	157.670	134.48	19.49	1,841.5	417,677	311.77	48.04
	Out			124.85	20.82	127.8	22,333	2.32	0.50

Particle Size Distribution(s) at Each Structure***Structure #4 (CULVERT 3):***

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	100.000%	100.000%
0.5000	100.000%	100.000%
0.3000	76.814%	100.000%
0.2000	57.610%	100.000%
0.1000	32.006%	100.000%
0.0500	20.804%	100.000%
0.0300	14.403%	100.000%
0.0200	12.802%	100.000%
0.0100	9.602%	80.773%
0.0050	6.401%	53.849%
0.0030	4.801%	40.387%
0.0010	0.800%	6.731%

Structure #3 (CULVERT 2A 4):

Size (mm)	In	Out
3.0000	98.024%	100.000%
2.0000	97.899%	100.000%
1.0000	97.648%	100.000%
0.5000	96.519%	100.000%
0.3000	74.147%	100.000%
0.2000	55.485%	100.000%
0.1000	31.187%	100.000%
0.0500	20.604%	100.000%
0.0300	14.467%	100.000%
0.0200	12.776%	100.000%
0.0100	9.519%	76.308%
0.0050	6.012%	48.191%
0.0030	4.446%	35.640%
0.0010	0.733%	5.873%

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Structure #1 (CLVERT 2):

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	100.000%	100.000%
0.5000	96.666%	100.000%
0.3000	73.651%	100.000%
0.2000	55.238%	100.000%
0.1000	30.688%	100.000%
0.0500	19.947%	100.000%
0.0300	13.809%	90.687%
0.0200	12.275%	80.611%
0.0100	9.206%	60.458%
0.0050	6.138%	40.305%
0.0030	4.603%	30.229%
0.0010	0.767%	5.038%

Structure #2:

Size (mm)	In	Out
3.0000	96.016%	100.000%
2.0000	94.024%	100.000%
1.0000	86.055%	100.000%
0.5000	63.146%	100.000%
0.3000	48.173%	100.000%
0.2000	36.193%	100.000%
0.1000	20.220%	100.000%
0.0500	13.232%	100.000%
0.0300	9.222%	100.000%
0.0200	8.205%	100.000%
0.0100	6.155%	88.728%
0.0050	4.102%	59.133%
0.0030	3.076%	44.346%
0.0010	0.513%	7.391%

Structure Detail:***Structure #4 (Pond)******CULVERT 3*****Pond Inputs:**

Initial Pool Elev:	428.57 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

No sediment capacity defined*Straight Pipe**

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
24.00	92.00	16.00	0.0240	428.57	0.90	0.00

Pond Results:

Peak Elevation:	430.56 ft
H'graph Detention Time:	0.05 hrs
Pond Model:	CSTRS
Dewater Time:	0.22 days
Trap Efficiency:	88.11 %

*Dewatering time is calculated from peak stage to lowest spillway***Elevation-Capacity-Discharge Table**

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
428.00	0.000	0.000	0.000	Top of Sed. Storage
428.50	0.003	0.001	0.000	
428.57	0.004	0.001	0.000	Spillway #1
429.00	0.013	0.004	1.185	1.70
429.50	0.028	0.015	3.758	1.70
430.00	0.050	0.034	7.167	1.70
430.50	0.058	0.061	11.231	0.20
430.56	0.059	0.065	11.772	0.05 Peak Stage
431.00	0.066	0.092	15.573	
431.50	0.074	0.126	19.061	

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Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
432.00	0.083	0.166	22.032	
432.50	0.093	0.210	24.663	
433.00	0.103	0.259	27.016	
433.50	0.114	0.313	29.187	
434.00	0.125	0.372	31.209	
434.50	0.137	0.438	33.110	
435.00	0.149	0.509	34.909	
435.50	0.162	0.586	36.624	
436.00	0.175	0.671	38.248	
436.50	0.189	0.761	39.808	
437.00	0.203	0.859	41.315	
437.50	0.218	0.964	42.775	
438.00	0.233	1.077	44.176	
438.50	0.249	1.198	45.534	
439.00	0.266	1.326	46.862	
439.50	0.283	1.463	48.145	
440.00	0.300	1.609	49.395	
440.50	0.325	1.765	50.625	
441.00	0.352	1.935	51.809	
441.50	0.379	2.117	52.836	
442.00	0.408	2.314	53.548	
442.50	0.437	2.525	54.260	
443.00	0.468	2.751	54.857	
443.50	0.499	2.993	55.350	
444.00	0.532	3.251	55.843	
444.50	0.565	3.525	56.336	
445.00	0.600	3.816	56.821	

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
428.00	0.000	0.000
428.50	0.000	0.000
428.57	0.000	0.000
429.00	(3)>1.185	1.185
429.50	(3)>3.758	3.758
430.00	(3)>7.167	7.167
430.50	(3)>11.231	11.231

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Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
431.00	(4)>15.573	15.573
431.50	(5)>19.061	19.061
432.00	(5)>22.032	22.032
432.50	(5)>24.663	24.663
433.00	(5)>27.016	27.016
433.50	(5)>29.187	29.187
434.00	(5)>31.209	31.209
434.50	(5)>33.110	33.110
435.00	(5)>34.909	34.909
435.50	(5)>36.624	36.624
436.00	(5)>38.248	38.248
436.50	(5)>39.808	39.808
437.00	(5)>41.315	41.315
437.50	(5)>42.775	42.775
438.00	(5)>44.176	44.176
438.50	(5)>45.534	45.534
439.00	(5)>46.862	46.862
439.50	(5)>48.145	48.145
440.00	(5)>49.395	49.395
440.50	(5)>50.625	50.625
441.00	(5)>51.809	51.809
441.50	(5)>52.836	52.836
442.00	(5)>53.548	53.548
442.50	(6)>54.260	54.260
443.00	(6)>54.857	54.857
443.50	(6)>55.350	55.350
444.00	(6)>55.843	55.843
444.50	(6)>56.336	56.336
445.00	(6)>56.821	56.821

Structure #3 (Pond)

CULVERT 2A 4

Pond Inputs:

Initial Pool Elev:	443.50 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**No sediment capacity defined*

Straight Pipe

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10

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
42.00	53.00	12.00	0.0240	443.50	0.90	0.00

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
30.00	48.00	6.00	0.0240	446.56	0.90	0.00

Pond Results:

Peak Elevation:	446.42 ft
H'graph Detention Time:	0.03 hrs
Pond Model:	CSTRS
Dewater Time:	0.23 days
Trap Efficiency:	87.53 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
443.00	0.000	0.000	0.000	Top of Sed. Storage
443.50	0.003	0.000	0.000	Spillway #1
444.00	0.011	0.004	2.591	1.75
444.50	0.023	0.012	7.333	0.20
445.00	0.041	0.028	13.465	2.40
445.50	0.064	0.054	20.730	0.80
446.00	0.092	0.093	28.971	0.15
446.42	0.120	0.138	36.559	0.15 Peak Stage
446.50	0.126	0.147	38.083	
446.56	0.130	0.155	39.231	Spillway #2
447.00	0.164	0.219	49.520	
447.50	0.207	0.312	63.402	
448.00	0.256	0.427	76.402	
448.50	0.309	0.569	89.511	
449.00	0.368	0.738	102.558	
449.50	0.431	0.937	115.682	
450.00	0.500	1.170	126.744	

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11

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
450.50	0.505	1.421	137.008	
451.00	0.510	1.675	146.467	

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
443.00	0.000	0.000	0.000
443.50	0.000	0.000	0.000
444.00	(3)>2.591	0.000	2.591
444.50	(3)>7.333	0.000	7.333
445.00	(3)>13.465	0.000	13.465
445.50	(3)>20.730	0.000	20.730
446.00	(3)>28.971	0.000	28.971
446.50	(3)>38.083	0.000	38.083
446.56	(3)>39.231	0.000	39.231
447.00	(3)>47.988	(3)>1.531	49.520
447.50	(3)>58.627	(3)>4.775	63.402
448.00	(5)>67.352	(3)>9.050	76.402
448.50	(5)>75.364	(3)>14.147	89.511
449.00	(5)>82.600	(3)>19.958	102.558
449.50	(5)>89.292	(3)>26.390	115.682
450.00	(5)>95.481	(5)>31.263	126.744
450.50	(5)>101.293	(5)>35.714	137.008
451.00	(5)>106.797	(5)>39.671	146.467

Structure #1 (Pond)

CLVERT 2

Pond Inputs:

Initial Pool Elev:	421.00 ft
Initial Pool:	0.00 ac-ft
*Sediment Storage:	0.00 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Straight Pipe

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12

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
42.00	122.00	2.70	0.0240	421.00	0.90	0.00

Pond Results:

Peak Elevation:	425.46 ft
H'graph Detention Time:	0.00 hrs
Pond Model:	CSTRS
Dewater Time:	0.23 days
Trap Efficiency:	84.77 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
419.50	0.000	0.000	0.000	Top of Sed. Storage
420.00	0.000	0.000	0.000	
420.50	0.000	0.000	0.000	
421.00	0.001	0.001	0.000	Spillway #1
421.50	0.002	0.001	2.591	1.70
422.00	0.002	0.002	7.333	0.20
422.50	0.003	0.004	13.465	0.95
423.00	0.005	0.006	20.730	1.40
423.50	0.006	0.008	28.971	0.75
424.00	0.007	0.012	38.083	0.30
424.50	0.009	0.016	47.988	0.10
425.00	0.011	0.020	58.627	0.05
425.46	0.012	0.026	66.613	0.10 Peak Stage
425.50	0.013	0.026	67.352	
426.00	0.015	0.033	75.364	
426.50	0.017	0.041	82.600	
427.00	0.019	0.050	89.292	
427.50	0.022	0.061	95.351	
428.00	0.025	0.072	100.123	
428.50	0.028	0.085	103.478	
429.00	0.031	0.100	106.728	
429.50	0.034	0.116	109.912	
430.00	0.037	0.134	112.967	
430.50	0.041	0.153	115.962	
431.00	0.045	0.175	118.886	

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13

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
431.50	0.048	0.198	121.721	
432.00	0.052	0.223	124.526	
432.50	0.057	0.250	127.223	
433.00	0.061	0.280	129.906	
433.50	0.066	0.311	132.499	
434.00	0.070	0.345	135.074	
434.50	0.075	0.382	137.572	
435.00	0.080	0.420	140.053	
435.50	0.109	0.468	142.464	
436.00	0.143	0.531	144.865	
436.50	0.182	0.612	147.193	
437.00	0.225	0.713	149.521	
437.50	0.273	0.837	151.776	
438.00	0.325	0.987	154.028	
438.50	0.382	1.163	156.226	
439.00	0.443	1.369	158.406	
439.50	0.509	1.607	160.556	
440.00	0.580	1.880	162.669	
440.50	0.682	2.195	164.776	
441.00	0.792	2.563	166.826	
441.50	0.911	2.988	168.876	
442.00	1.037	3.475	170.887	
442.50	1.172	4.027	172.877	
443.00	1.315	4.648	174.859	
443.50	1.467	5.343	176.793	
444.00	1.626	6.116	178.727	
444.50	1.794	6.971	180.632	
445.00	1.970	7.911	182.513	

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
419.50	0.000	0.000
420.00	0.000	0.000
420.50	0.000	0.000
421.00	0.000	0.000
421.50	(3)>2.591	2.591
422.00	(3)>7.333	7.333

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14

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
422.50	(3)>13.465	13.465
423.00	(3)>20.730	20.730
423.50	(3)>28.971	28.971
424.00	(3)>38.083	38.083
424.50	(3)>47.988	47.988
425.00	(3)>58.627	58.627
425.50	(5)>67.352	67.352
426.00	(5)>75.364	75.364
426.50	(5)>82.600	82.600
427.00	(5)>89.292	89.292
427.50	(5)>95.351	95.351
428.00	(6)>100.123	100.123
428.50	(6)>103.478	103.478
429.00	(6)>106.728	106.728
429.50	(6)>109.912	109.912
430.00	(6)>112.967	112.967
430.50	(6)>115.962	115.962
431.00	(6)>118.886	118.886
431.50	(6)>121.721	121.721
432.00	(6)>124.526	124.526
432.50	(6)>127.223	127.223
433.00	(6)>129.906	129.906
433.50	(6)>132.499	132.499
434.00	(6)>135.074	135.074
434.50	(6)>137.572	137.572
435.00	(6)>140.053	140.053
435.50	(6)>142.464	142.464
436.00	(6)>144.865	144.865
436.50	(6)>147.193	147.193
437.00	(6)>149.521	149.521
437.50	(6)>151.776	151.776
438.00	(6)>154.028	154.028
438.50	(6)>156.226	156.226
439.00	(6)>158.406	158.406
439.50	(6)>160.556	160.556
440.00	(6)>162.669	162.669
440.50	(6)>164.776	164.776
441.00	(6)>166.826	166.826
441.50	(6)>168.876	168.876
442.00	(6)>170.887	170.887

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
442.50	(6)>172.877	172.877
443.00	(6)>174.859	174.859
443.50	(6)>176.793	176.793
444.00	(6)>178.727	178.727
444.50	(6)>180.632	180.632
445.00	(6)>182.513	182.513

Structure #2 (Pond)

BASIN 015

Pond Inputs:

Initial Pool Elev:	396.70 ft
Initial Pool:	0.30 ac-ft
*Sediment Storage:	2.70 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
398.90	10.00	2.00:1	2.00:1	10.00

Fixed Siphon

Crest Elev	Inlet Elev	Outlet Elev	Diameter (in)	Length (ft)	Manning's n
398.00	396.70	390.00	4.00	75.00	0.0130

Pond Results:

Peak Elevation:	401.11 ft
H'graph Detention Time:	2.91 hrs
Pond Model:	CSTRS
Dewater Time:	0.93 days
Trap Efficiency:	93.06 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

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16

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
396.09	0.478	0.000	0.000		Top of Sed. Storage
396.40	0.494	0.151	0.000		
396.70	0.510	0.301	0.000		
396.90	0.520	0.404	0.904	1.38*	
397.20	0.537	0.563	0.925	2.07*	
397.40	0.549	0.672	0.939	1.40*	
397.90	0.579	0.953	0.972	3.51*	
398.00	0.585	1.012	0.978	0.72*	Spillway #2
398.40	0.609	1.250	1.004	2.90	
398.90	0.640	1.562	1.035	3.70	Spillway #1
399.40	0.669	1.890	3.149	2.45	
399.90	0.699	2.232	29.636	0.90	
400.40	0.729	2.588	62.079	2.55	
400.90	0.760	2.961	103.184	0.65	
401.11	0.770	3.125	124.848	0.15	Peak Stage
401.40	0.787	3.347	154.137		
401.90	0.814	3.748	215.214		
402.40	0.842	4.162	286.754		
402.90	0.870	4.589	369.119		
403.40	0.899	5.032	462.678		
403.90	0.929	5.489	567.804		
404.40	0.959	5.961	684.865		
404.90	0.990	6.448	814.223		

*Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
396.09	0.000	0.000	0.000
396.40	0.000	0.000	0.000
396.70	0.000	0.000	0.000
396.90	0.000	0.904*	0.904
397.20	0.000	0.925*	0.925
397.40	0.000	0.939*	0.939
397.90	0.000	0.972*	0.972
398.00	0.000	0.978	0.978
398.40	0.000	1.004	1.004
398.90	0.000	1.035	1.035

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17

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
399.40	2.083	1.065	3.149
399.90	28.541	1.095	29.636
400.40	60.955	1.124	62.079
400.90	102.032	1.152	103.184
401.40	152.957	1.180	154.137
401.90	214.007	1.207	215.214
402.40	285.521	1.234	286.754
402.90	367.859	1.260	369.119
403.40	461.393	1.285	462.678
403.90	566.494	1.311	567.804
404.40	683.530	1.335	684.865
404.90	812.863	1.360	814.223

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18

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#4	1	17.150	0.125	0.000	0.000	65.000	S	12.73	1.658
	Σ	17.150						12.73	1.658
#3	1	35.560	0.125	0.000	0.000	65.000	S	26.40	3.439
	2	7.600	0.125	0.000	0.000	75.000	M	12.54	1.302
	Σ	43.160						38.94	4.741
#1	1	66.260	0.125	0.000	0.000	71.000	S	66.95	8.165
	Σ	66.260						66.95	8.165
#2	1	12.000	0.050	0.000	0.000	81.000	F	34.93	3.074
	2	19.100	0.125	0.000	0.000	65.000	S	14.18	1.847
	Σ	157.670						134.48	19.485

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#4	1	0.320	200.00	19.00	0.0030	1.0000	1	3.1	2,080	1.49	0.97
	Σ							3.1	2,080	1.49	0.97
#3	1	0.320	200.00	18.00	0.0030	1.0000	1	6.5	2,131	1.53	1.00
	2	0.250	50.00	1.00	0.0500	1.0000	2	0.7	652	0.47	0.30
	Σ							7.2	1,663	1.19	0.80
#1	1	0.320	200.00	22.00	0.0030	1.0000	1	22.4	3,144	2.26	1.45
	Σ							22.4	3,144	2.26	1.45
#2	1	0.320	200.00	19.00	0.9000	1.0000	1	1,834.2	555,573	415.45	272.99
	2	0.240	200.00	19.00	0.0030	1.0000	1	2.6	1,581	1.13	0.74
	Σ							1,841.5	417,677	311.77	48.04

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	7. Paved area and small upland gullies	2.78	50.00	1,800.00	3.350	0.149

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19

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	Time of Concentration:					0.050

**KODIAK MINING COMPANY, LLC.
COKE MINE NO. 1, P-3887**

STABILITY ANALYSIS

No stability analysis was performed due to no changes to the embankment or spillway system.